



TECHNOVANZA

Taking technology to society



VJTI ROBOTICS CHALLENGE

OPERATION SHAKTI

POKHRAN: INDIA FLEXES NUCLEAR MUSCLES

5 Decades ago, after achieving an astonishing victory in the Indo-China war. China started its nuclear programme to boast its nuclear supremacy, while India had its own reasons to watch them helplessly. During that period our late former PM Atal Bihari Vajpayee quoted, “**Answer to an atom bomb is an atom bomb**”. The answer to defeat cannot be compassion & hence the Indian regime decided that it's time to thrash its sleighty neighbours into pieces. After some close debacles a whirlwind came on 11th & 13th of May 1998 as India's then PM Mr. Atal Bihari Vajpayee and his National security advisor Brajesh Mishra announced that India had conducted a set of 5 nuclear tests despite huge international pressure, which stunned the whole world giving US & CIA the worst nightmares. The neighbours were squirmed & Indians experienced a proud moment of prestige.

Those tests set India on a road that led to a global acknowledgement and it got the global high table make space for India. Operation Shakti succeeded in the Indian Army's Pokhran Test Range. India test detonated a thermonuclear device, a fission device and a sub-kiloton device namely Shakti I, Shakti II and Shakti III on that day. **BARC, DRDO, AMDER** and the **58th Regiment of Army's Corps of Engineers** played a major role in this operation. The bombs were transported from BARC to Chhatrapati Shivaji International Airport (AP). From there, they were flown to Jaisalmer Army Base in Indian air force's AN-32 plane. Further they were transported to Pokhran in an army convoy of trucks. The devices were delivered to the device assembly building named, the **Prayer Hall**. The devices were monitored and triggered from the **Deer Park (Control Room)** and the generators supplied power to the range from the **Farmhouse (Power house)**. The devices were placed in the shafts having the code name **White House, Taj Mahal and Kumbhakaran**. On 11th May 1998 at 3:45 pm, Pokhran team, headed by **Bharat Ratna Dr. Abdul Kalam, Padma Vibhushan Dr. Anil Kakodkar and Padma Vibhushan Dr. R Chidambaram**, detonated the three devices & played a vital role in pursuing this dream. Prime Minister Atal Bihari Vajpayee declared India a “**Full-fledged nuclear weapons state**”. He also improvised on the slogan and said, “**Jai Jawan, Jai Kisan, Jai Vigyan**”. To remember this success, every year 11th may is celebrated as the “**National Technology Day**”.



INTRODUCTION:

Team Specification: A team can consist of maximum 6 participants. Students from different educational institutes can form a team.

CERTIFICATION:

1. Certificate of Participation will be awarded to all the teams. Certificate of Excellence will be given to the top three teams.
2. Disqualified teams will not be considered for any certificates.

Cash Prize of INR 70,000 to be won.

Certificates will be given on the spot.

FREE Registration for all the events and non-commercial exhibition.

CHARACTERS:

- Pokhran Team (Manual robot)
- Army Vehicle (Auto robot)

ARENA:

- The field consists of an area having dimension 6m × 7.2m.
- The game field consists of-
 1. BARC
 2. Airport (AP)
 3. Jaisalmer Gate (JG)
 4. Pokhran Gate (PG)
 5. Entry Passcode Section
 6. Army Base Entrance
 7. Army Base Gate
 8. Prayer Hall (Assembly Hall)
 9. Deer Park (Control Room)
 10. Shafts:
 - a. White House
 - b. Taj Mahal
 - c. Kumbhakaran

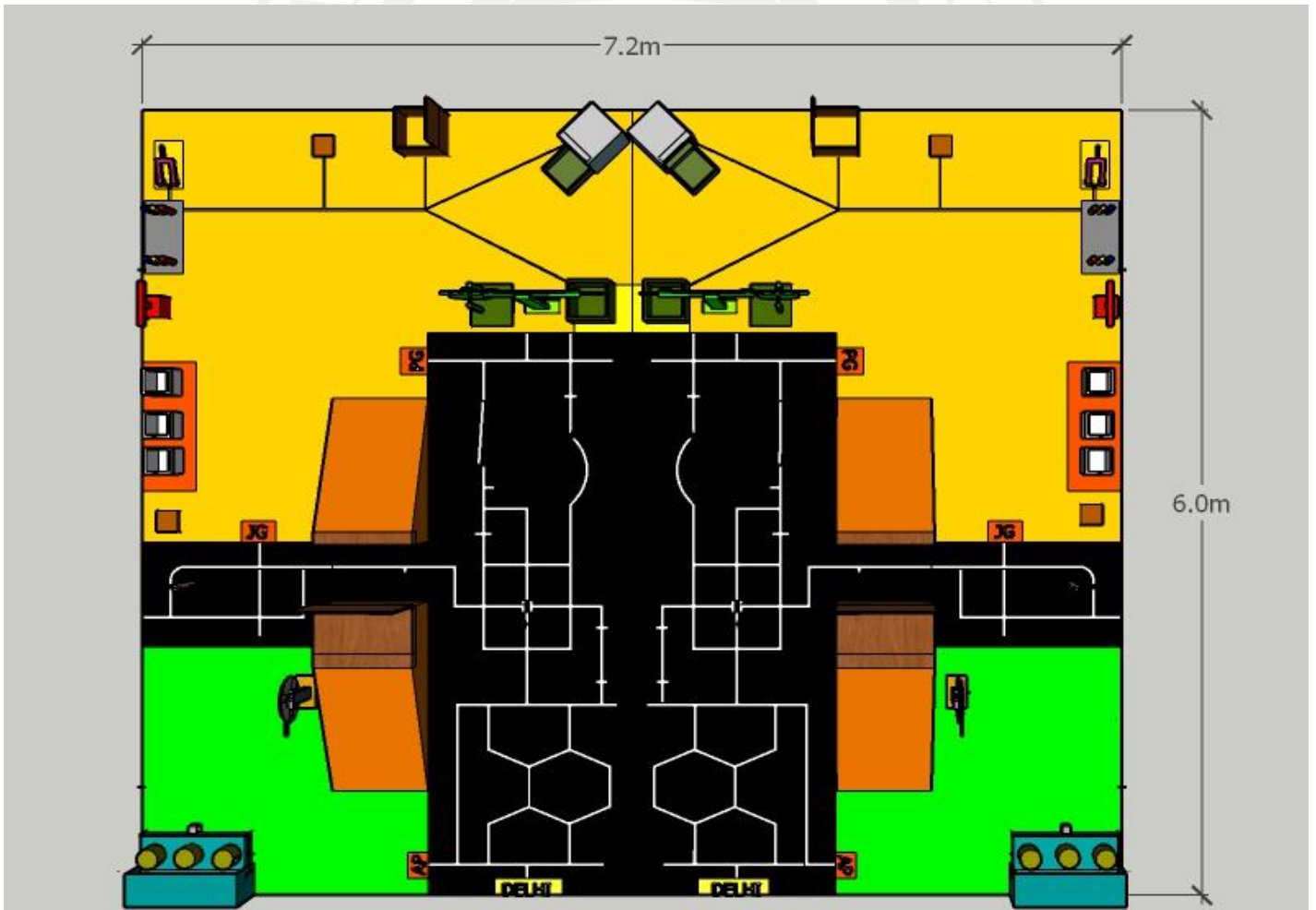


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28th, 29th & 30th Dec, 2018

- 11. Farm House (Power House)
- 12. Delhi
- 13. Supply Junction (N1) and Power Junction (N2)

FULL ARENA TOP VIEW:

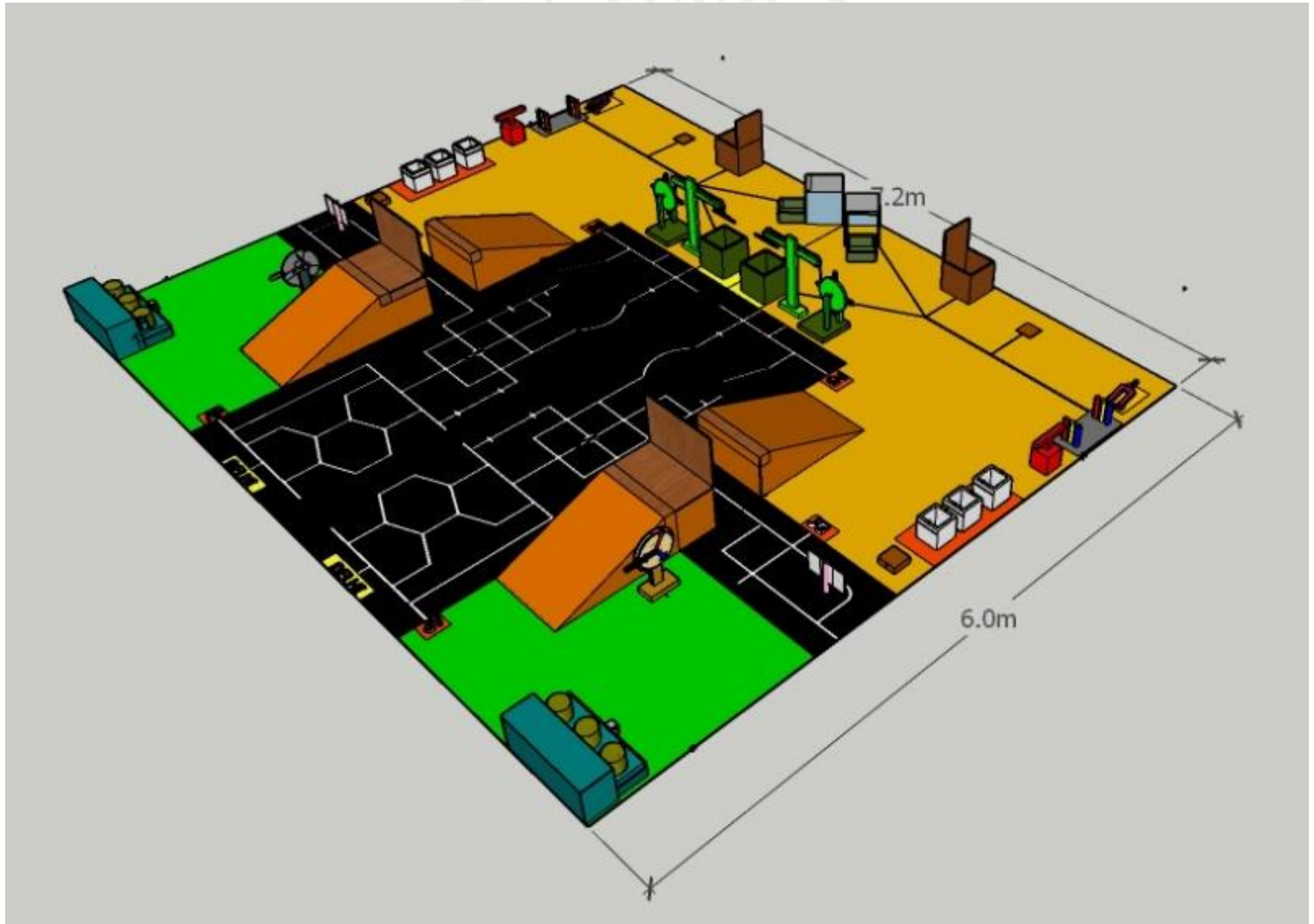




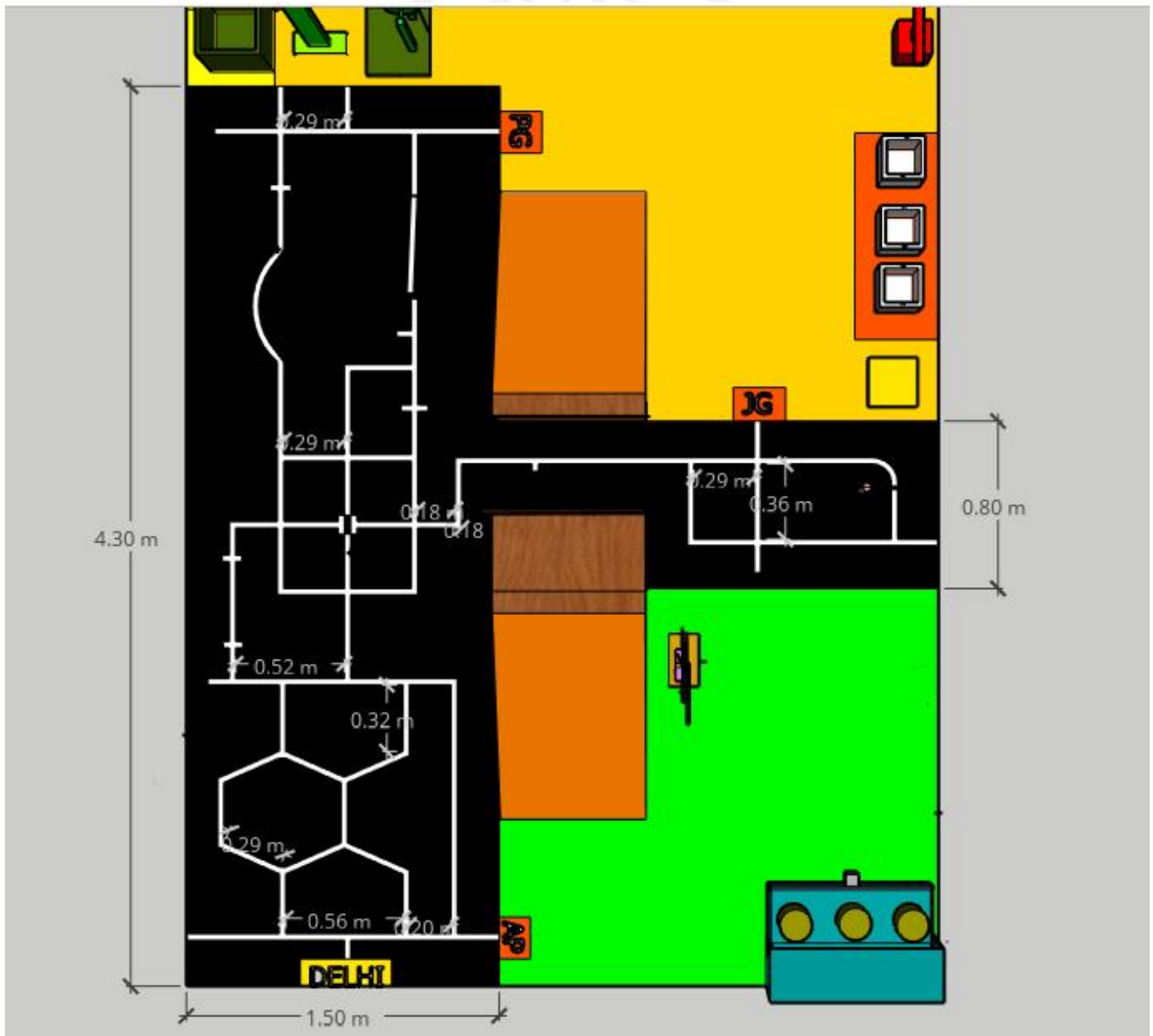
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28th, 29th & 30th Dec, 2018

FULL ARENA ISO-VIEW:

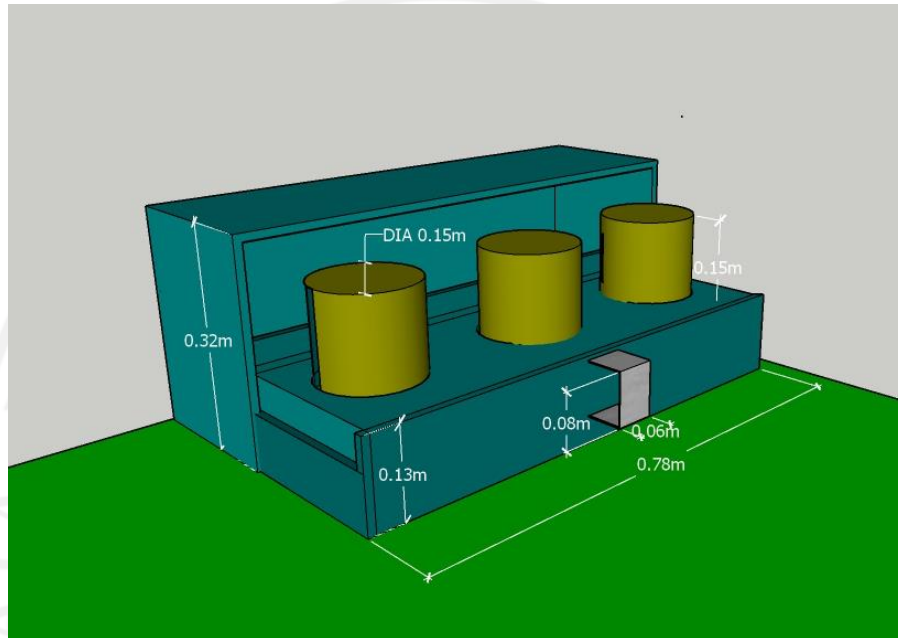


AUTO ROBOT ARENA:

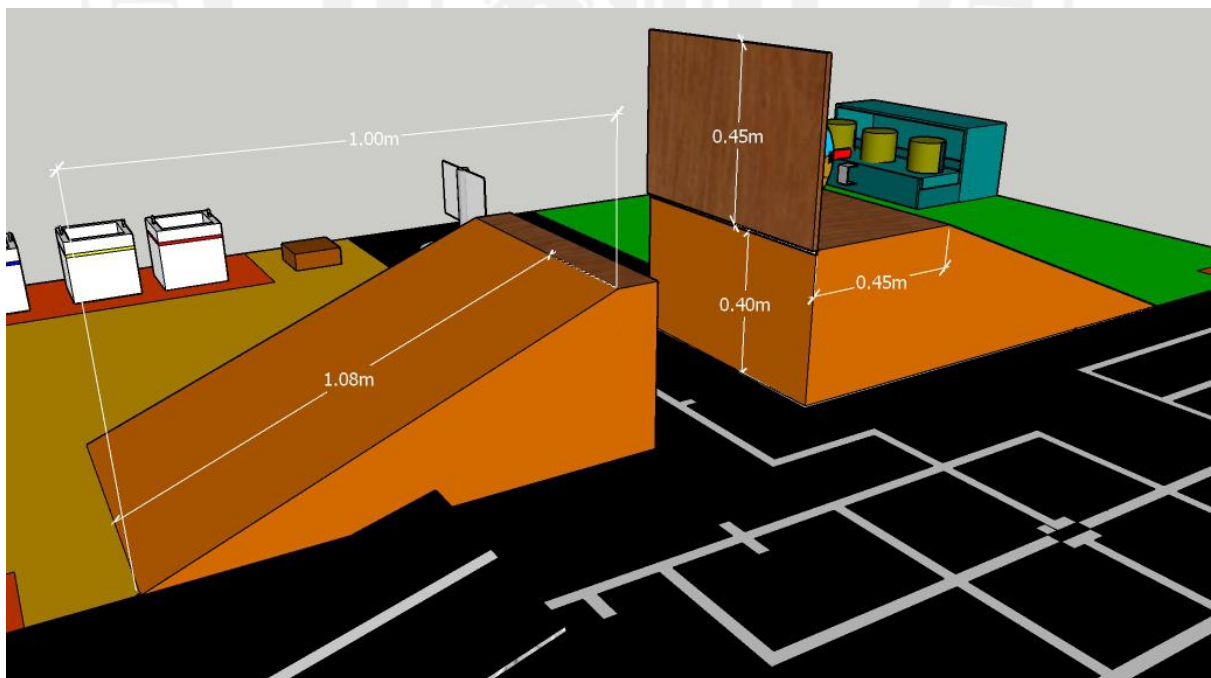




BARC:



ARMY BASE ENTRANCE (BRIDGE):

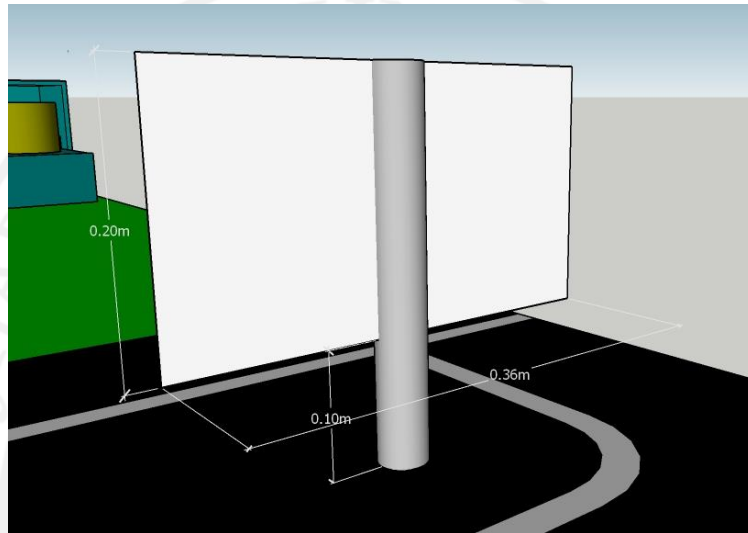




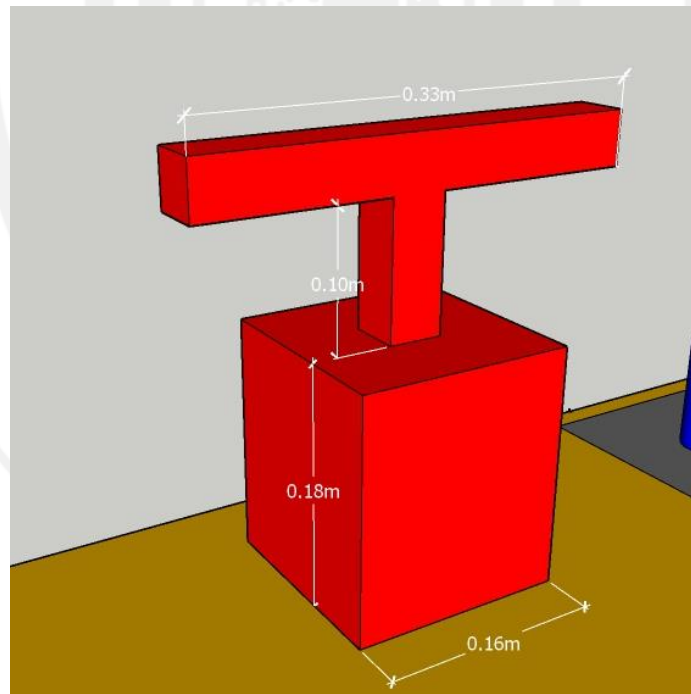
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ARMY BASE GATE:



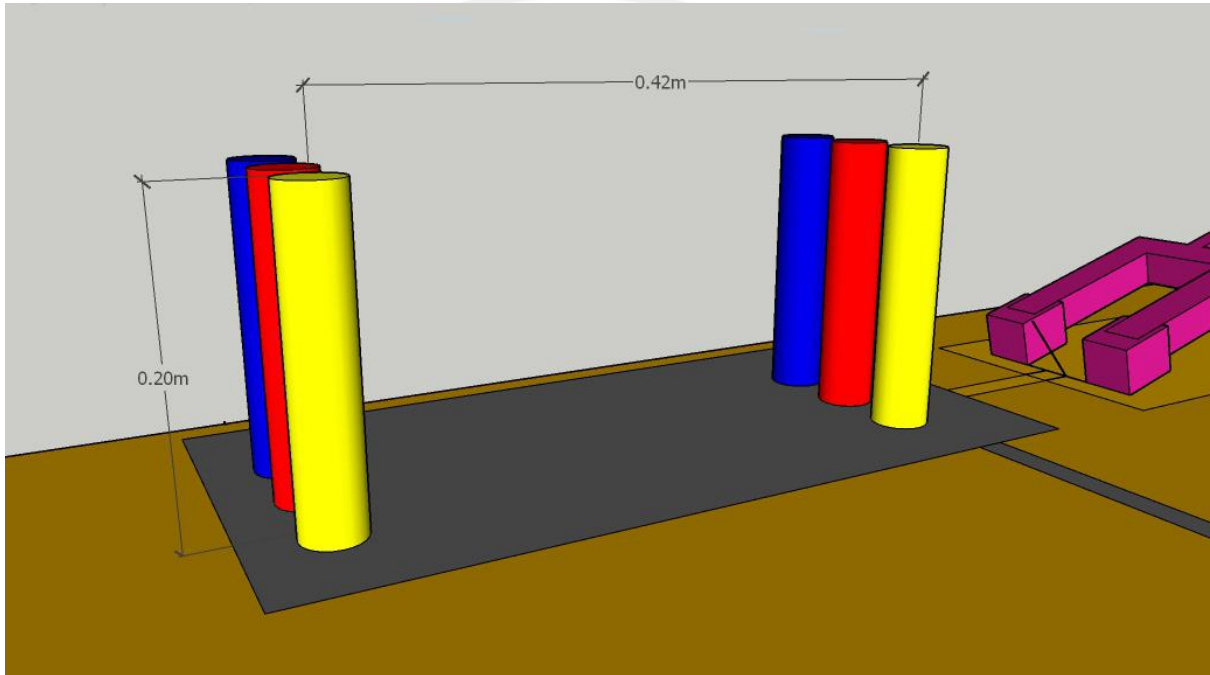
DETONATOR:



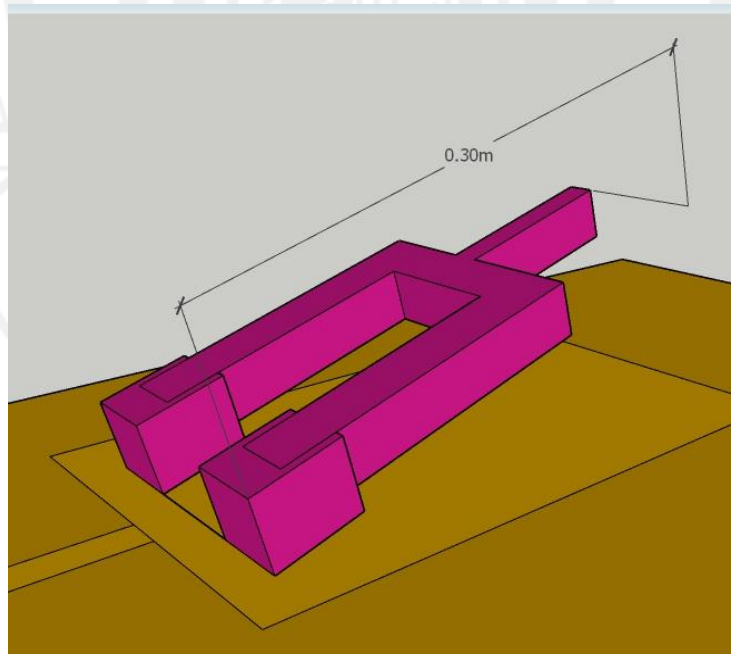


FARM HOUSE:

1.WIRES:



2.SWITCH:

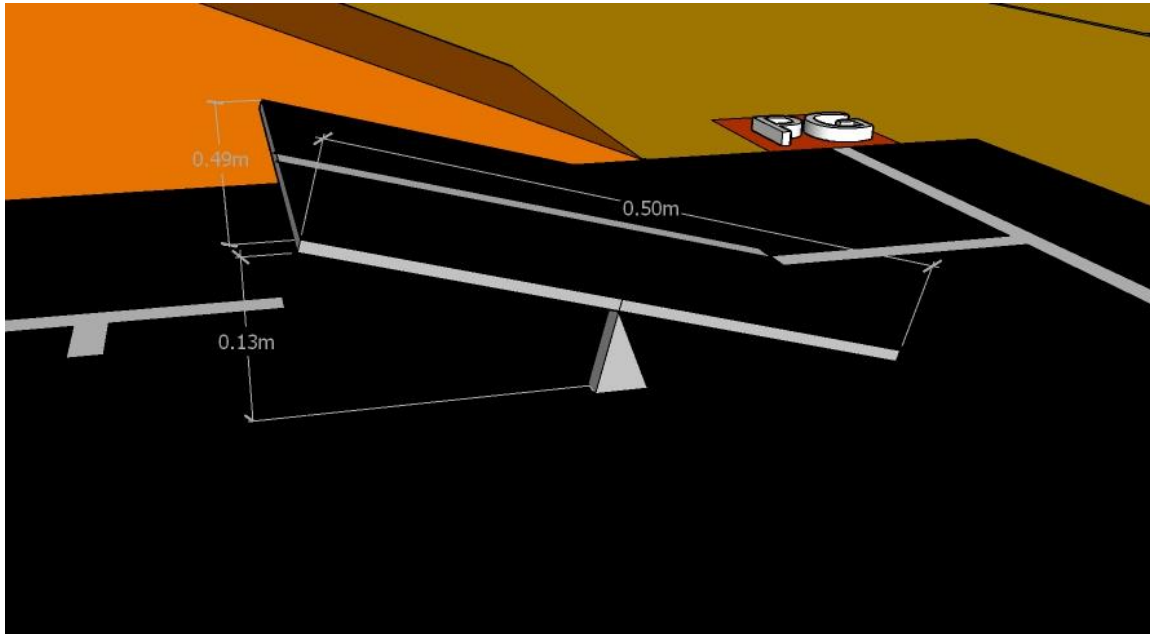




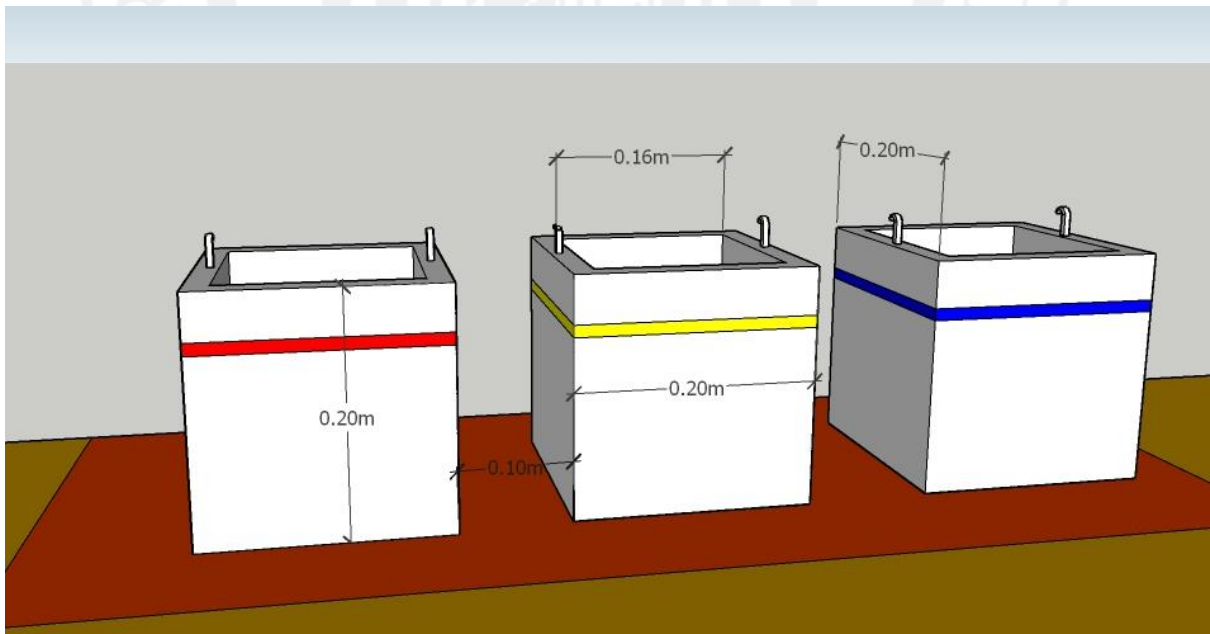
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SEE-SAW:

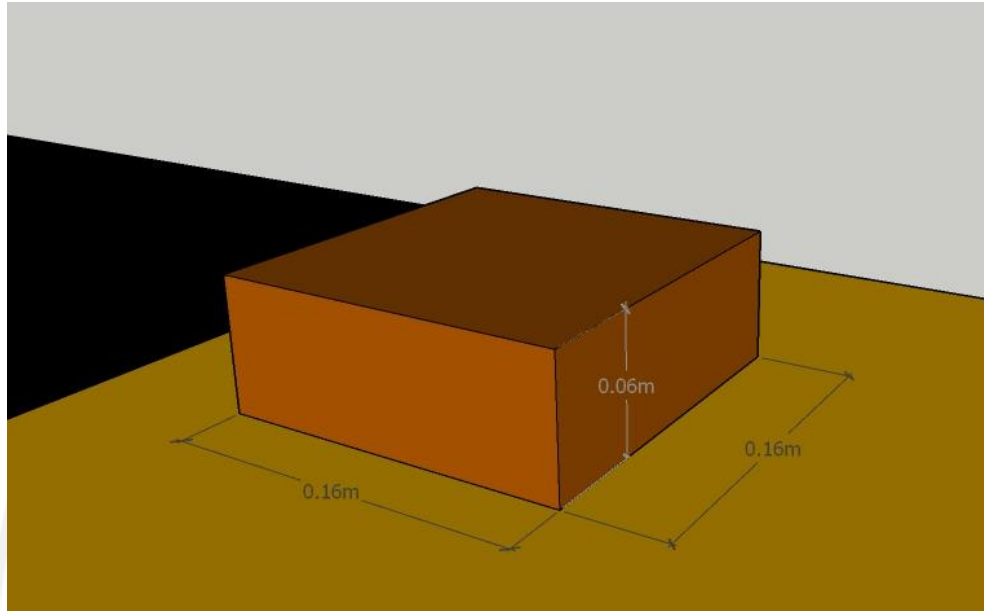


SHELLS:

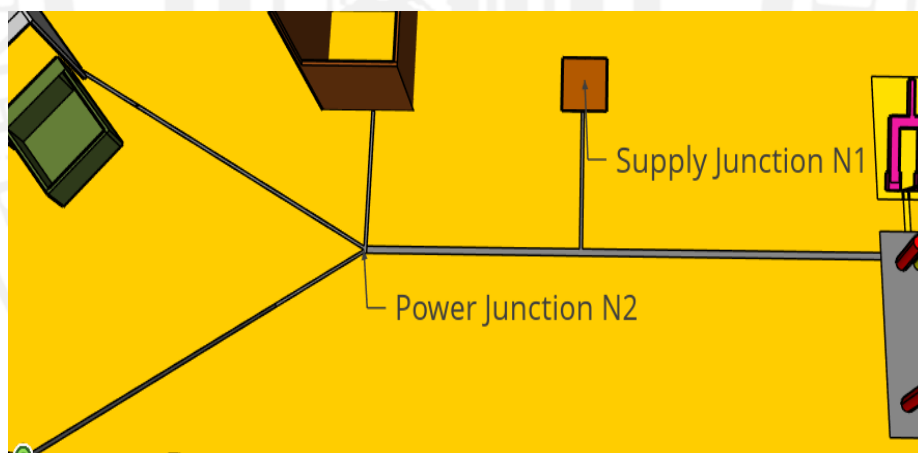




COVERING:

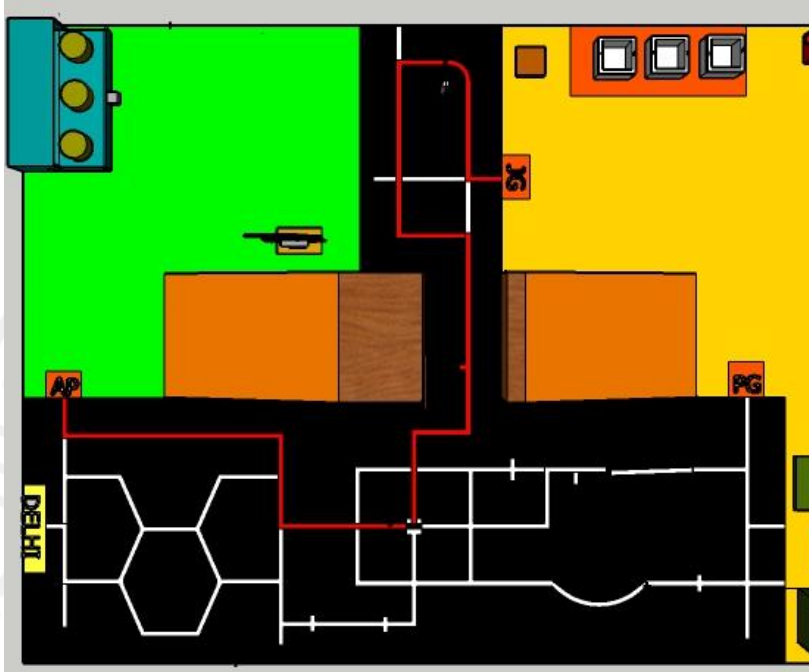


SUPPLY JUNCTION AND POWER JUNCTION:

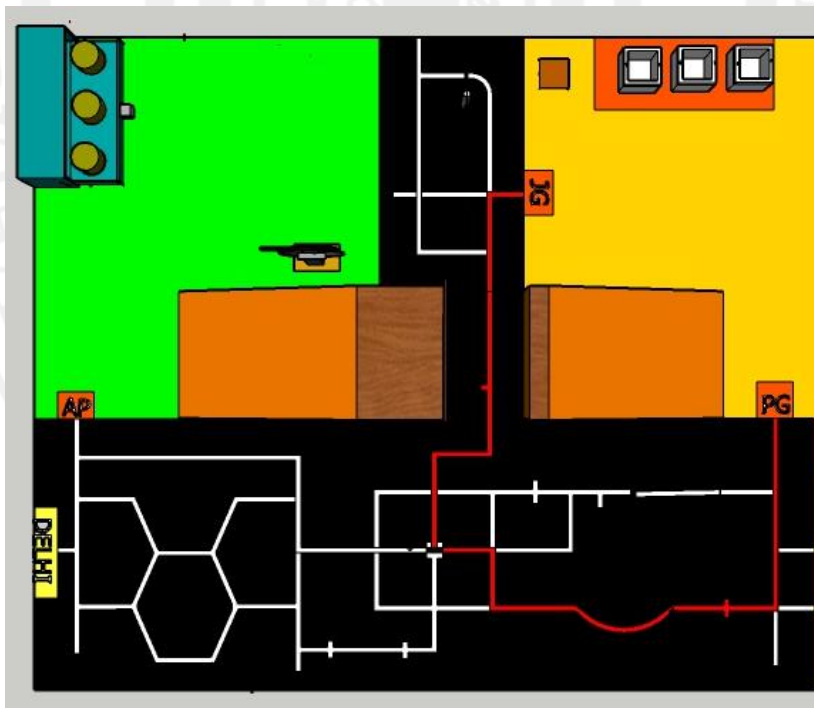




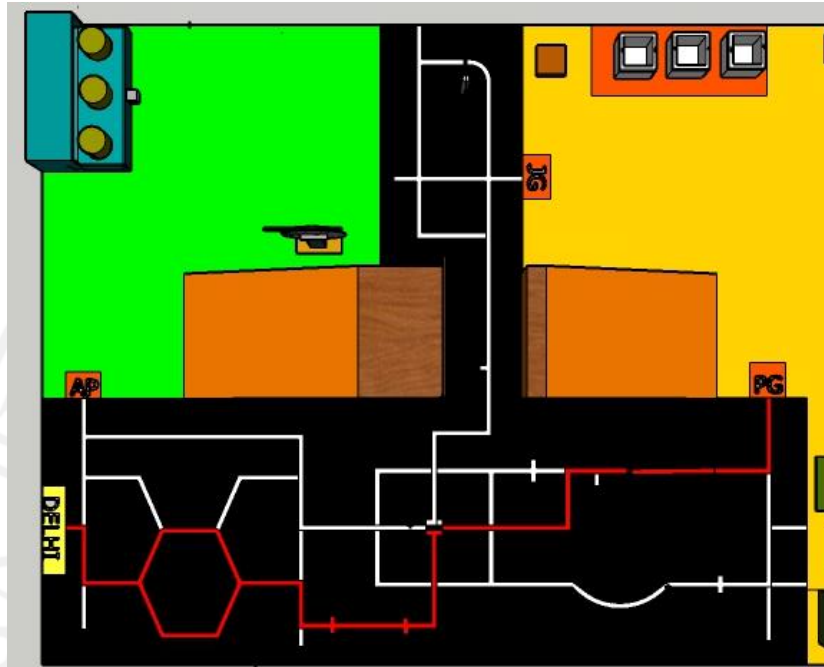
AUTO ROBOT PATH 1 FROM AP TO JG:



AUTO ROBOT PATH 2 FROM JG TO PG:



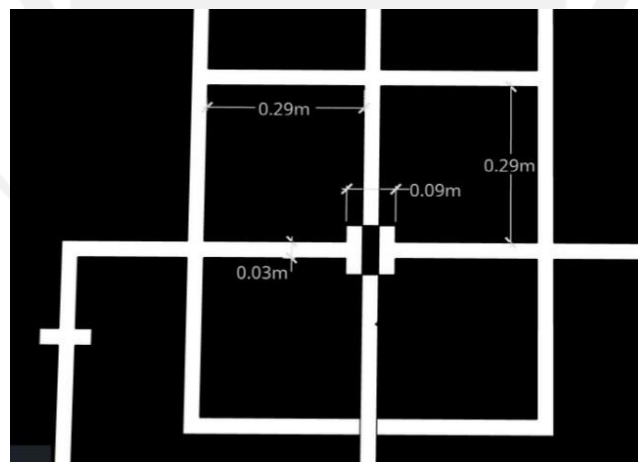
AUTO ROBOT PATH 3 FROM PG TO DELHI:



Note: Auto robot must trace the hexagonal path at least once while travelling from Pokhran Gate (PG) to Delhi.

ALL AUTO PATHS SHOWN ABOVE ARE COMPULSARY AND MUST BE TRACED EXACTLY AS HIGHLIGHTED. IF THE AUTO ROBOT STRAYS AWAY FROM THE ABOVE-MENTIONED PATHS, THEN IT MUST RESTART FROM THE PREVIOUS DESTINATION.

JAISALMER JUNCTION:





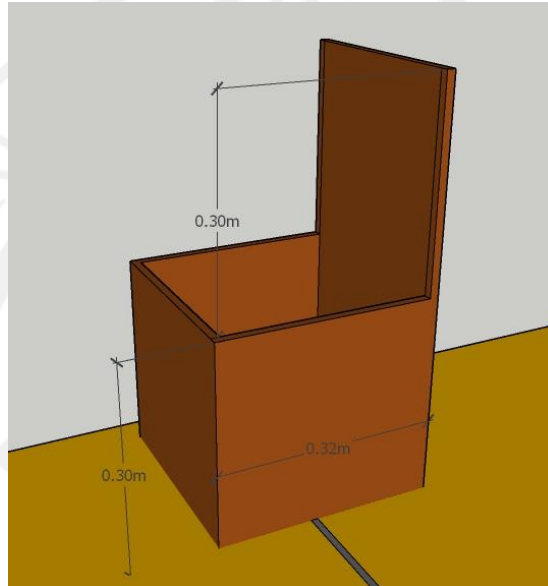
GAMEPLAY:

1. Manual robot starts the **OPERATION SHAKTI** by collecting 2 bombs from **BARC** by opening the drawer and hands over these bombs to the auto robot At **Airport (AP)**.
2. Auto robot then starts his journey from Airport (AP) towards Jaisalmer via **Army base gate** [Path 1].
3. Meanwhile Manual robot spins the **passkey wheel**.
4. Manual Robot collects the 3rd bomb from **BARC** reaches the **Army base entrance** & crosses the **Army Base entrance** by dropping the plank of the bridge, which is initially placed vertically on the path.
5. Manual Robot assembles the bomb in the respective Shell present in the **Prayer hall**.
6. Manual robot collects both the bombs from the auto robot at **Jaisalmer Gate (JG)** and assembles them in shells, then it hands over the wire covering to the auto robot.
7. Manual robot then keeps the shells containing bombs in their respective shafts according to the passkey task performed (**KUMBHAKARAN, WHITE HOUSE, TAJ MAHAL**) strictly in sequence.
8. Manual robot goes to the **Farmhouse** (power house) connects the wires and closes the switch.
(NOTE: Switch can ONLY be closed after connecting wires)
9. Meanwhile auto robot reaches the **Pokhran Gate (PG)** and handovers the wire covering to the manual robot [Path 2]. Manual robot covers the **Supply Junction (N1)** with the covering.
10. Auto robot then goes to the **Headquarters (Delhi)** and receives the permission of detonation (by tracing the 3rd auto robot path as given in the screenshot)
11. **FINAL TASK:** -After getting the permission manual robot keeps the detonator on the **Power Junction (N2)** & detonates all 3 bombs by pressing the detonator [Path 3].



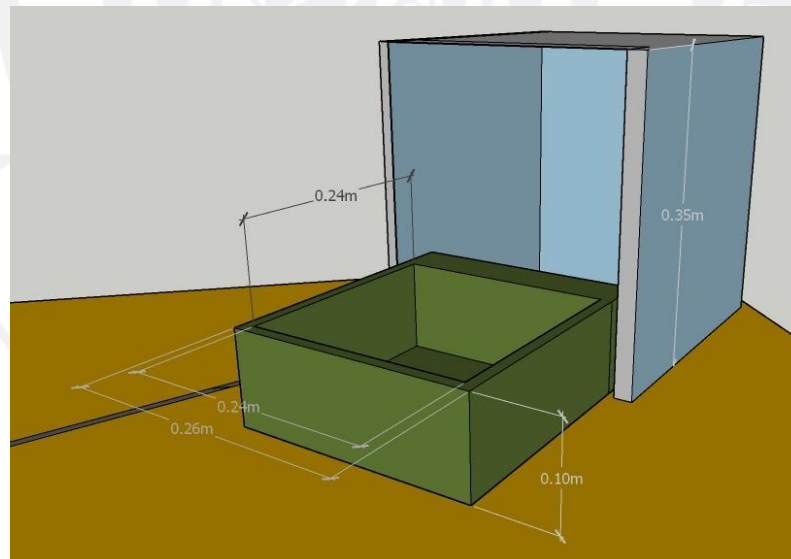
- **KUMBHAKARAN SHAFT:**

Manual bot has to place the shell inside the shaft and has to close the lid of the shaft.



- **TAJMAHAL SHAFT:**

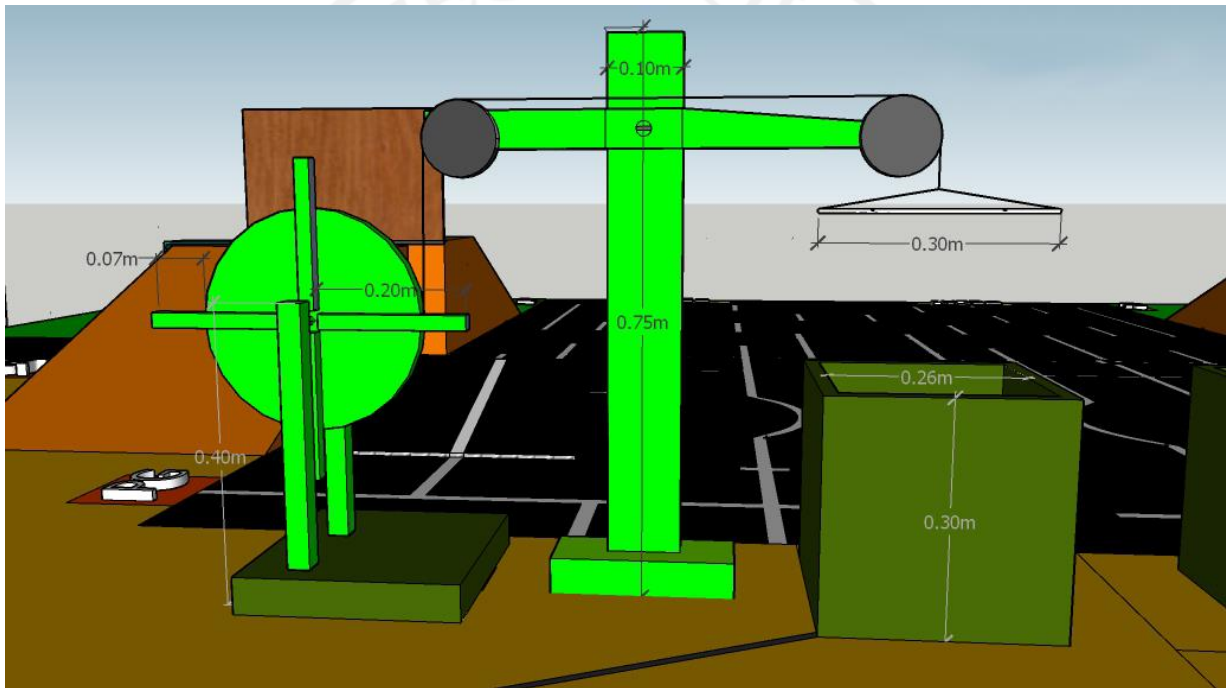
Manual robot has to place the shell in the bogie, and has to push the bogie inside the shaft.





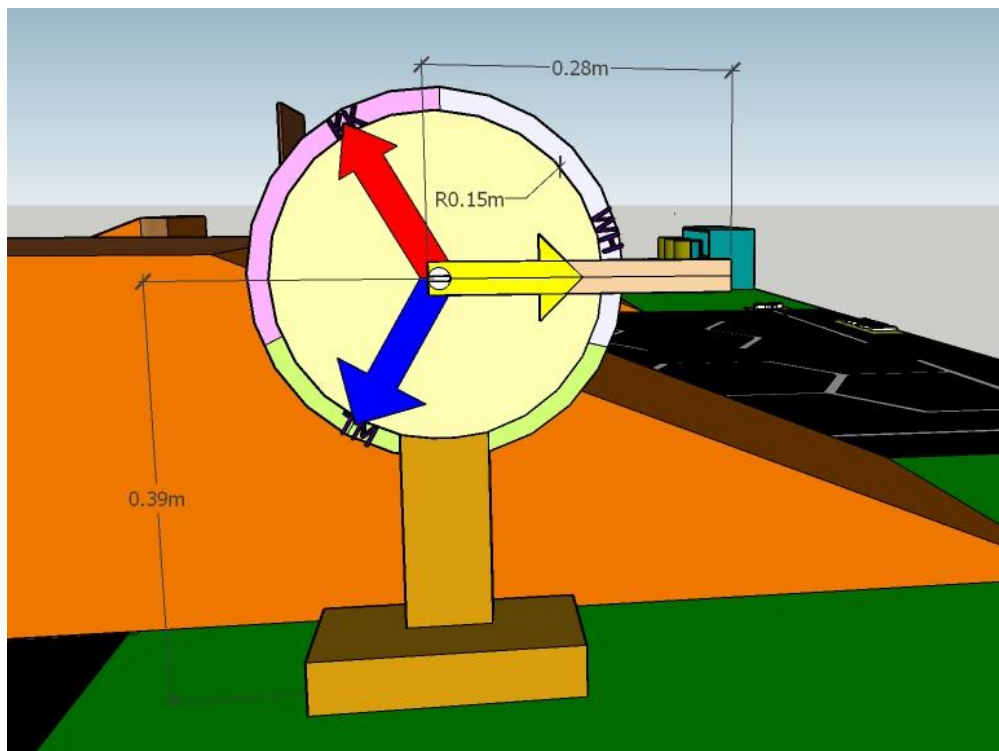
- **WHITE HOUSE SHAFT:**

Manual Robot has to hang the shell to the crane and has to rotate the wheel to lower the shell in the shaft.





- **PASSKEY:**



Manual Robot spins the wheel. When the wheel stops spinning, depending on the name pointed by the coloured arrows, place the coloured shells in the respective shafts.

KK - Kumbhakaran

WH - White House

TM - Taj Mahal

For example: If the **blue** arrow points toward the KK, then place the shell with **blue** strip in the Kumbhakaran shaft.

ALL COLOURS ARE GIVEN FOR REFERENCE ONLY AND MAY BE SUBJECT TO CHANGE.



GAME RULES:

1. The maximum time given for completing the tasks is 5 minutes.
2. The operator of Pokhran Team (Manual robot) cannot be changed during the match.
3. Auto Robot is allowed to move in the auto zone only.
4. Manual Robot cannot drag the bombs and must pick /place them appropriately in their correct zones.
5. If suppose Manual robot drops any of Bomb/Shell/ Detonator/Covering, it must restart the current task.
6. In case of a wired robot, the wire must be slack at any point of time during the game. The total length of wire extending from the remote control to the manual robot must be of minimum 2.5 meters.
7. After starting the Auto robot, the team member who performs the starting action must leave the game arena immediately.
8. Both the robots cannot enter the arena of the opponent's team.
9. Laptops/personal computers are not allowed near the arena once the match starts. Other Wi-Fi, Bluetooth, etc. devices must be switched off. The organizers hold the rights to check for these devices and their usage and disqualify the team.
10. The organizers may stop any robot at any time if they feel that it is performing or is about to perform any action that is dangerous or hazardous to people or equipment. No robot is allowed to use any inflammable, combustible, explosive or potentially dangerous process.
11. **The time measured by the organizers will be final and will be used for scoring the teams. Time measured by any contestant by any other means is not acceptable for scoring.**
12. **In case of any disputes/discrepancies, the organizer's decision will be final and binding. The organizer reserves the right to change any or all of the above rules as they deem fit. Change in rules, if any will be highlighted on the website and notified to the registered team.**



SAFETY FOR THE ROBOTS:

- 1) All robots must be designed and manufactured so as to cause no damage to any robots of the opposing team or to the game field.
- 2) Combustible-fuel-driven engines, explosives, high-pressure pneumatics (e.g. 1 mega Pascal), power-generating chemicals, and undamped spring actuators (which make an action less than half a second) are all prohibited for motion propulsion or expansion of Robot's size.

If a laser emitting device is used, it must be of class 2 or less. In deploying the laser, full care must be taken to protect all people at the venue from harm during all procedures. In particular, the laser beams must be oriented such that the beam will not be aimed sloping upwards, or horizontally to hit the eyes of sitting spectators.

- 3) All Robots must be designed and manufactured so as to pose no danger of any kind to any person at the venue

RESTARTS:

- 1) If suppose the Auto robot drops Bomb/shell/shell containing bomb or Covering of wires, it must restart from its previous destination.
- 2) If the Auto robot doesn't choose the correct path, then it must restart from the starting point of the previous task.
- 3) In case of a restart, the timer will not be set back to zero and time will not be paused.
- 4) During restarts for the Auto robot, a contestant cannot feed any information to it. However, participants are allowed to adjust sensor (gain, position etc.) and make minor repairs. A participant should not alter it in a manner that changes its weight (e.g. removal of a bulky sensor array or switching to lighter batteries to get better speed).

Any restart for Auto robot requires the approval of the organizers before it can be removed from the arena. If removed without approval, it will be considered as a violation.



ROBOT SPECIFICATIONS:

One- Manual robot (POKHRAN TEAM)

One- Line follower robot (ARMY VEHICLE) are required for each team.

• Army Vehicle (Auto Robot)-

1. The Auto robot must be completely autonomous and it must run on principles of line following.
2. The Auto robot should not exceed the dimensions of size **35cm×35cm×35cm** (l×b×h). Auto robot can expand, stretch or extend within a cylinder of length 35cm considered from the top view. No stretch up in height is allowed.
3. The starting procedure of Auto robot should be simple and should not involve giving it any manual force or impulse in any direction.
4. The Weight of the Auto robot should not exceed **8 Kg**.
5. Auto robot must be a single body and should not split into parts.
6. Only one Auto robot is allowed.

• Pokhran Team (Manual Robot)-

1. Teams should use wired or wireless remote control for controlling the Manual Robot.
2. Only one team member is allowed to control the robot in the game field.
3. Robot should not exceed the dimensions of 50cm×50cm×60 cm (l×b×h). Manual robot can expand, stretch or extend without any limits after the start of the run.
4. Manual robot is not allowed to leave anything behind or make any marks while traversing or damage the arena in any way. If it is found damaging the arena, the team will be immediately disqualified.
5. The Manual robot cannot be constructed using readymade Lego kits or any readymade mechanism or readymade base/chassis. However, readymade gear assemblies can be used. Violating this clause will lead to disqualification of the team.
6. Only one Manual robot is allowed.

POWER SUPPLY:

1. Both the Robots must use an on-board power supply. External power supply is not allowed and will not be given.
2. The potential difference between any two points should not be greater than 24V DC.



CONTROLS:

1. Manual robot (POKHRAN TEAM) should receive signal only from a single remote control. It can be wired or wireless.
2. Auto robot (ARMY VEHICLE) cannot be controlled by wireless or wired controller.

JUDGING CRITERIA:

SR NO.	TASKS	POINTS
1.	Opening the Drawer	10
2.	Removing and placing the 2 bombs from BARC to Auto robot	20 (10 each)
3.	Spinning of the passkey wheel.	10
4.	Collecting the third bomb from BARC and crossing the army base entrance (bridge) and placing the bomb in the shell. (Points will not be awarded if the bridge is crossed multiple times.)	25
5.	Auto robot travels from AIRPORT (AP) to JAISALMER GATE (JG) with the 2 bombs on it.	10
6.	Opening the gate to Pokhran Range (done by auto robot)	10
7.	Collecting 2 bombs from auto robot and placing it in the shells.	20



8.	Placing the wire covering on the auto robot.	5
9.	Auto robot travels from the JAISALMER GATE (JG) to the POKHRAN GATE (PG) with the Covering.	10
10.	Manual robot lifts the covering and places it on the supply junction.	5
11.	Auto robot crosses the see-saw (Points will be awarded for crossing the see-saw ONLY once.) while successfully travelling from Pokhran gate (PG) to Delhi for permission. (The Auto robot should not carry any object while taking permission.)	25
12.	Placing bomb in the Kumbhakaran shaft and closing its lid.	10
13.	Placing and pushing the bomb in the Taj Mahal shaft.	10
14.	Hanging the bomb to the crane and lowering the bomb entirely in the shaft. (White house)	15
15.	Performing the three SHAFT tasks in order (Kumbhakaran>White house > Taj mahal)	5
16.	Connecting the wires and connecting the switch.	10
17.	Placing the detonator on Power Junction and pressing it. (NOTE: This task can be performed if and only if ALL tasks are performed by manual robot and auto robot)	10

TOTAL POINTS: 210



- **THE TASKS THAT CAN BE SKIPPED ARE:**

1. Opening drawer of BARC
2. Dropping the plank
3. Rotating the wheel of White house shaft

10 POINTS WILL BE DEDUCTED PER SKIPPED TASK.

VIOLATIONS:

1. The team with five violations in a match will be disqualified. Negative scores may appear in some cases.
2. When the Violations occur, 10 points will be deducted from the team. The team must bring the violating Robot back to the point where the referee indicates. The Violations are categorized as follows:
 - a. Any part of the Robot entering their respective restricted areas. The Auto robot cannot enter in Manual Robot and vice versa.
 - b. Other actions that infringe on the rules without mentioning in the Disqualification are considered as Violation.

DISQUALIFICATION:

1. A team will be disqualified if it commits any of the following actions during the match:
 - a) The team performs any acts that are not in the spirit of fair play.
 - b) The team fails to obey instructions or warnings issued by the referees.
 - c) Auto Robots must not receive remote instructions from any human in the venue, sent via any form of RF or non-RF communication. Doing so will lead to disqualification.
 - d) The team has made five Violations in the same match.
 - e) In case while crossing the bridge if manual robot falls on auto arena.
2. Auto Robot is not allowed to leave anything behind or make any marks while traversing or damage the arena in the autonomous zone. Any Robot found damaging the arena will be disqualified immediately.



FINAL SCORE:

1. Team completing the tasks first will be considered as winners.
2. If both the teams could not complete the tasks then the team with maximum points will be the winner.
3. The rules and the regulations for the tie break would be told by the organizers before the event.

IMPORTANT NOTE: LEGO, VEGA OR ANY OTHER TYPE OF READYMADE ROBOT KITS ARE NOT ALLOWED. IF FOUND SO, THE TEAM WILL BE DISQUALIFIED.

Rules mentioned above are subject to change any time. Participants should check for the latest updated pdf on the official website of technovanza'18. However, this draft is to be followed as the latest version. Technovanza reserves all right regarding rules and regulations.

Any ingenious exploitation of the mentioned/gameplay must be notified to and clarified with the organizers beforehand.

In case of any ambiguity, feel free to contact

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